C·R·E·S®
CENTER FOR REPRODUCTION OF ENDANGERED SPECIES

REPORT
WINTER 1995

Looking Into the Future for CRES

Each time I give a tour of the CRES facility at the San Diego Zoo, I am repeatedly amazed at the high caliber and quantity of research that has been accomplished in such a small facility. Originally built in 1926 to serve primarily as the clinical hospital for the Zoo, it was never designed for the types of scientific technology that CRES scientists engage in today.

My vision of the future of CRES, therefore, is closely linked with the creation of a new CRES facility that provides approximately three times the space available in the present facility. Even in the face of a fine record of scientific accomplishments, there is an urgency to accomplish much more for the sake of endangered animals.

In order to do so, the individual programs of CRES need room and resources to enlarge their staff and expand their efforts. Additional research disciplines also need to be added to those already a part of the CRES program. These would more fully address problem areas where scientific research can contribute to the improvement of the health and welfare not only of animals in our collections but also worldwide. These new areas of needed research include pathology and all the subspecialty topics with which it is concerned, such as microbiology, parasitology, and toxicology.

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Because it is impossible to sex many birds visually, CRES scientists started basic research to determine sex in birds in the 1970s. Without this technique, it would have been impossible to save the California condors.

CRES® is operated by the Zoological Society of San Diego.

African Hunting Dog
Studies to enhance captive breeding. See page 3.

Bonner Summer Interns
An opportunity to help make a difference. See page 4.

Adopt a Polar Bear!
Help us help endangered species. See page 5.

1975–1995
20th
ANNIVERSARY
CRES

Looking Into the Future for CRES

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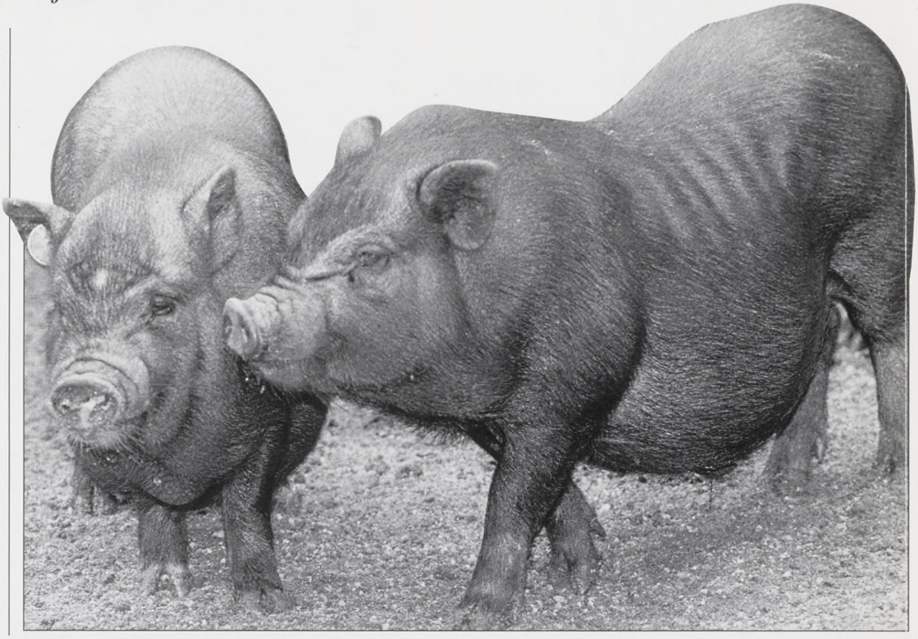
Nutrition is another area which has only this year been added to the veterinary services department. It, too, requires adequate facilities and increased staffing to engage in much needed nutritional research and investigation.



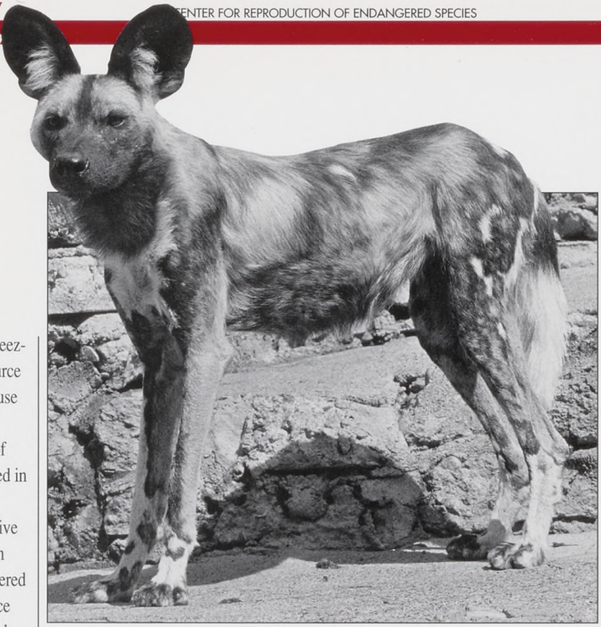
The expansion of the overall research program of CRES will include increased research and conservation activity in the field, locally and globally, often in collaboration with curators, veterinarians, and other personnel. I also expect that CRES research findings will lead to a greater role for CRES staff in animal management decisions and programs. Certainly, as CRES resources grow, so will its role in assisting with the solutions of animal health, reproduction, and management problems.

Another important future goal of CRES is to have its operating budget fully endowed at a level of 35 million dollars so that there will be funds to provide support for increased field conservation projects and external research applications related to our mission: “To develop, gather and increase knowledge vital for the establishment of self-sustaining populations of wildlife.”

The affiliation of the Zoological Society of San Diego with the American Museum Association has brought another dimension to the programs of the Society: increased activity in the conservation of endangered plant species, many of which are in our collections. The preservation of endangered species may well involve research on plant species through a future new branch of CRES.

The past 20 years of CRES development have taken great effort and dedication, but they have been exciting years. We look forward to a future for CRES that allows for scientific creativity and expansion.

—Werner Heuschele, D.V.M., Ph.D., Director of CRES



Reproductive Physiology

Germ plasm cryopreservation (the freezing of sperm and ova) is a vital resource for captive-breeding programs, because it minimizes the space and costs required for holding large numbers of individuals. Germ plasm can be stored in liquid nitrogen until it is needed to enhance the genetic diversity of captive or wild populations. However, frozen reserves of germ plasm from endangered species are useful only if they produce offspring when thawed. Optimum techniques for freezing and thawing ova and sperm are currently being developed in CRES' reproductive physiology laboratory. Once thawed, ova and sperm must be prepared for fertilization. It is the preparation or "capacitation" of sperm prior to *in vitro* fertilization that is the focus of a current study.

Capacitation of mammalian sperm is a complex series of biochemical and physical changes that prepare sperm for fusion with the ovum. Under *in vivo* conditions, these changes are induced by the cells surrounding the freshly ovulated ovum. In the lab, treatment of sperm with specific chemicals or biological agents can mimic the process of capacitation and render sperm capable of fertilization. Experiments are being conducted to determine the *in vitro* conditions necessary for capacitation of sperm of carnivores. These studies will enhance captive-breeding efforts for endangered species such as the African hunting dog, the cheetah, and the giant panda.

CRES Grants and Donors

The Zoological Society of San Diego gratefully acknowledges the following for their recent grants in support of CRES. ***Lockheed Martin*** *has made a contribution toward student internships for CRES through the Jewell H. and James T. Bonner Summer College Student Fellowship Endowment Fund. The grant will allow deserving students to participate in conservation research during the summer of 1996. An* ***anonymous*** *donor has made a grant in support of Dr. Nancy Harvey's study on parental care and chick development in captive California condors. Results from the study will directly benefit the field biologists when the released condors become reproductive adults. Special thanks to* ***Toray Industries*** *for becoming a CRES Conservator. This contribution will be applied to the CRES Endowment to help ensure continued research for wildlife preservation.*

More on Panda Paternity Testing

In 1994, CRES geneticist Dr. Oliver Ryder prepared the necessary international permit to import giant panda hairs. He then traveled to China and returned with hair samples for DNA analysis. Paternity determination in giant pandas is an important component of conservation efforts for captive and wild populations. In China, many giant panda babies are born following a combination of natural matings and artificial inseminations utilizing semen of several different male giant pandas. Consequently, paternity for a number of baby giant pandas born in China remains unresolved.

Pioneering efforts at CRES by Chinese scientist Ya-ping Zhang, working in Dr. Ryder's lab, have produced a DNA test that is highly accurate and performs well with samples collected through noninvasive procedures. A single shed hair with attached follicles provides enough DNA for our test.

In 1995, Dr. Ryder returned to China, this time visiting Dr. Zhang in his laboratory at the Kunming Institute of Zoology. Additional giant panda paternity tests have been undertaken and definitive results obtained.

The next steps will be to collect samples from wild populations of giant pandas, which will assist behavioral scientists who wish to understand the genetic structure of giant panda populations across their range and the paternity of giant panda offspring born in their studied populations.

Behind the Scenes at CRES with the Bonner Summer College Student Interns

Dedicated summer student interns Laura McGeehan (left) and Yvonne Milewski (right) are actively participating in CRES research.

When Jewell H. and James T. Bonner established the Bonner Summer College Student Fellowship Endowment Fund at CRES in 1994, they provided an opportunity for young researchers to work on projects that can improve the health and well-being of vanishing wildlife species. By sponsoring a summer intern, you can join the Bonners and help CRES in its research efforts. For more information, please call Amy Parrott in the San Diego Zoo's Development Office at (619) 685-3213.

The drill *Papio leucophaeus* is a highly endangered forest-dwelling baboon from the rain forests of western Africa. Unlike its counterpart, the mandrill, the drill has fared poorly in zoo collections. There are only 23 individuals in North American zoos, and only 3 infants have been born during the past 10 years. The Zoological Society of San Diego has had a breeding program for this species for nearly a decade, but no females have become pregnant.

Our best hope for reproduction now resides in three females and a male that have been living in a large outdoor corral at the Wild Animal Park since 1989. Observations conducted by the behavior division of CRES have failed to document any mating behavior, probably due to a motivational deficiency in the male. However, male deficiencies might be an indication that females are not experiencing regular episodes of estrus. Something more than behavioral observations seemed indicated in order to pinpoint the problem.

Earlier this year, the entire drill population was relocated to the CRES research facility at the San Diego Zoo in order to collect urine from the females for hormonal assay. This procedure would indicate which females, if any, still have reproductive potential. Given their ages of 13, 14, and 20, which is relatively old for nonhuman primate females, we wanted to determine if our females were still capable of reproducing before undertaking such measures as artificial insemination, should the problem turn out to be a sexually dysfunctional male.

Laura McGeehan, a graduate student in anthropology at Arizona State University, had heard of the activities of CRES, and she inquired about spending a summer at CRES working on endocrine/behavior problems in primates. Soon after coming to San Diego as a Bonner Summer Student Intern, Laura began showing up before dawn each morning at our research facility in order to get the very first, and best, urination of the day from each of the three drill females. This proved to be difficult, probably because the females had been living for several years in a "hands-off" situation at the Wild Animal Park, and because they were minimally interested in food rewards as inducement to enter the urine-collecting cages. After several weeks of effort, and with the assistance of the Society's animal trainers, Laura has been storing—in the freezer and on a daily basis—urine samples from all three females.

. . . an opportunity for young researchers to work on projects that can improve the health and well-being of vanishing wildlife species.

In addition, she developed and perfected an ethogram, or catalog of behaviors, that can be retrospectively correlated with the hormonal state of females, and she worked out a system for precisely measuring the swelling of the females' "sexual skin," often regarded as an external indicator of their cycle state.

Laura spent portions of her days in San Diego in the endocrine laboratory at CRES, learning from Dr. Mike Jurke and Nancy Czekala how to run urinary and fecal assays. Before returning to classes at Arizona State in the fall, Laura left behind three well-trained drill females, and three well-trained behavioral observers who are carrying on the work in her absence. She will return to CRES during winter semester break to complete the endocrine work. This information will provide the basis for our next decision as to how to proceed with our efforts in propagating this endangered primate. In addition, it will add significantly to a skimpy data base on the menstrual cycles of drills.

As for Laura, she has found her niche, and she plans to use her summer experience at CRES as the basis for doctoral dissertation research and, if all goes well, in becoming the "Jane Goodall" of drills.

—Donald Lindburg, Ph.D.,
Behavior Division Head

As more of the world's birds become increasingly endangered or threatened

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Adopt a Polar Bear!

It's easy and fun to adopt! The animal lover you love is sure to be delighted when they find this unique gift under the tree:

- **A cuddly, plush polar bear of their very own**
- **A handsome adoption certificate**
- **Two complimentary guest passes to the San Diego Zoo or San Diego Wild Animal Park**
- **A subscription to *CRES Report***
- **A special gift card to announce your gift adoption.**

And . . . the knowledge that your contribution will help us help the many endangered species at the San Diego Zoo and the San Diego Wild Animal Park.

Why not share a special Holiday Season with someone you love by adopting a polar bear!

Animal adoptions are a great way to celebrate with your family and friends all year long.

- **Why not ring in the New Year with a ring-tailed lemur!**
- **Give that special someone a Valentine gift they'll be wild about!**

*Special Adoption Rate $99**

- **Brighten someone's birthday with a sun bear or a rainbow lorikeet!**

NOTE: Naturally, your adopted polar bear will remain at the Zoo or the Wild Animal Park in the care of our professional staff. Please be aware that the lives of animals for adoption are subject to unavoidable changes. For that reason, adoptions are offered by species only, not by individual animal.

* Special adoption rate good through December 31, 1995.

ANIMAL ADOPTION APPLICATION

☐ **YES,** I want to adopt a polar bear as a gift for:

Name(s) ____________________

Address ____________________

City ____________ State ____ Zip ______

Please sign the special card announcing my gift adoption as follows:

____

Name(s) ____________________

Address ____________________

City ____________ State ____ Zip ______

Phone (day) __________ (evening) __________

Member Number ____________________

☐ Also, please enter my own adoption for a polar bear at the special rate of $99 for one year.

Please make checks payable to the Zoological Society of San Diego and mail to:

The Zoological Society of San Diego
Adopt-An-Animal Program
P.O. Box 271
San Diego, CA 92112

Or, to charge your adoption by telephone, call (619) 557-3974 between 8:30 A.M. and 4 P.M., Monday through Friday. Orders must reach the San Diego Zoo by December 15th to ensure delivery by Christmas.

☐ Please check here if you'd like more information about our Adopt-An-Animal Program.

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Bonner Summer Intern Program

Continued from page 4

by loss of habitat, introduction of foreign animal species to delicate ecosystems, and direct poaching for the pet trade, captive propagation becomes increasingly important. Creating an environment conducive to avian propagation requires an integrated research effort that includes animal care staffs at the San Diego Zoo and the Wild Animal Park, veterinarians, and the pathology department at CRES.

Yvonne Milewski, a recent graduate from the University of Connecticut, participated in a variety of pathology department activities as a Bonner Fellow. She observed and assisted with mammalian and avian necropsies and attended morbidity and mortality rounds and discussions.

Yvonne spent the summer compiling the 1993, 1994, and 1995 histopathologic and microbiologic data from the pathology computerized records. Through examination of causes of infertile eggs and embryonic (*in ovo*), hatchling, and fledgling losses, the pathology department is working to identify ways to improve captive propagation. Her project was to determine the importance of microbial infections in limiting the success of captive propagation of endangered avian species. Yvonne found that 38 percent of the losses were due to infections, primarily bacterial in origin. The data are still being analyzed, but Yvonne's work will be a great help with strategic planning for next year's breeding season.

—Linda Lowenstine, Ph.D.,
Director of Pathology Division

CRES Wish List

They are disappearing before our very eyes—endangered species. CRES researchers have been working for 20 years to stem the tide of the Earth's vanishing wildlife, and they have some remarkable achievements to their credit. Past issues of *CRES Report* have contained updates on condor recovery, cheetah breeding, and other successful conservation programs involving CRES research.

Financial assistance is an ongoing need for the acquisition of the very special equipment and supplies required by CRES staff, which include:

- PCR Thermal Cycler,
  MJ Research—DNA engine thermal-cycler chassis, $5,495.
  Alpha unit for *in situ* amplification, $3,495.
  Alpha unit for conventional amplification, $2,495.
  This equipment will provide significant improvements in the certainty and speed of in-house diagnoses for many diseases.
- Biological Safety Cabinet,
  Forma Scientific—
  Laminar-flow hood, $5,800.
  Floor stand, $325.
  Ultraviolet decontamination light, $190.
  Current unit must be replaced to provide proper protection when working with infectious agents.
- Zeiss Inverted Microscope,
  Fisher Scientific—
  Microscope, $3,430.
  Eyepiece package, $1,150.
  This is a research quality microscope necessary for the specialized work conducted in CRES laboratories.
- 10 trees for lion-tailed macaque corral at Wild Animal Park, $12,000.
  These trees will provide arboreal enrichment for the macaques.
- Nikon Optiphot compound microscope, $16,050.
  Needed for photographing chromosomes to document cytogenetic data.
- Automatic Pipetting Station, $20,000.
  Extremely time-saving and accurate equipment used to transfer small quantities of liquid samples for hormone analysis of endangered species.
- High Speed Centrifuge,
  Beckman Instruments—
  Refrigerated centrifuge, $35,000.
  This will replace a 20-year-old centrifuge that has become increasingly expensive to service and maintain and which is no longer adequate for work requirements.

CRES REPORT
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SAN DIEGO ZOO · SAN DIEGO WILD ANIMAL PARK

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Post Office Box 551
San Diego, California 92112

CRES REPORT
CENTER FOR REPRODUCTION OF ENDANGERED SPECIES

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